THE SANTA LUCIA CUPRESSUS SARGENTII GROVES AND THEIR ASSOCIATED NORTHERN HYDROPHILOUS AND ENDEMIC SPECIES

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Cupressus sargentii Jepson occurs in the Coast Ranges of California from extreme northern Mendocino County in the North Coast Ranges to Santa Barbara County in the South Coast Ranges, where its most southern locality is an isolated outpost in the San Rafael Mountains. Throughout its range it is known as a species which is almost always restricted to soils of serpentine content. It is common over large areas in the North Coast Ranges, but occurs much more sparingly and interruptedly in the South Coast Ranges. In the Santa Lucia Mountains of the South Coast Ranges, it is restricted to a few small areas in Monterey and San Luis Obispo counties. Several local endemics, with only minor exceptions, are restricted to the same habitat. In addition, the dampest and most shaded groves provide ecological niches where several northern hydrophilous species persist.

The groves of *C. sargentii* in the Santa Lucia Mountains occur on metamorphosed serpentine which was formed at various times during the Jurassic Age. In the Santa Lucias the exposed serpentine extends for nearly forty miles along the major fault zones of the range from south of the Cuesta Grade in San Luis Obispo County to Plaskett Creek in Monterey County. It is often slightly oxidized and owes much of its red color to superficial deposits of water-borne iron. It is also highly faulted, metamorphosed, and intruded with volcanics. Basalt, rhyolite, radiolarian chert, and local concentrations of various minerals are often found in conjunction with it. Gold, chrome, and quicksilver have all been mined near one or another of the cypress groves, and there may be commercial deposits of manganese present. The cypress grove south of Lion Den Spring is the only grove which occurs on a substratum obviously different from the usual form of serpentine. Here the serpentine is thoroughly impergnated with aluminum, and the resultant soil is white. Although geologists suspect that the cypress groves may indicate the presence of some mineral besides serpentine, no such correlation has yet been established for the Santa Lucia cypress groves.

Actually the cypress groves occupy only a tiny fraction of the total area of serpentine in the Santa Lucia Mountains. The combined areas of the *C. sargentii* groves can scarcely exceed four or five square miles, whereas the serpentine formations of the Santa Lucias have a total area of roughly 400 square miles. The cypress groves are found along either the King City or the Pine Mountain faults, regions of numerous springs,

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and the groves occur at the heads of the streams which are, in all but the very dryest years, permanent or semipermanent. The cypresses extend down the mountains along the streambeds, especially on the northeast slopes of the range, and isolated trees frequently grow in the streambeds below the groves.

Most of the cypress groves are located along the main ridge of the Santa Lucias at altitudes of about 2500 feet. There are also some cypress groves near Bryson on the ridge formed by the King City Fault, the largest of which is on Waterdog Creek at elevations of 2000 to 2500 feet. A few miles south of this grove there used to be "cedars in swamps," but the trees never reached maturity after a fire in 1953, and they were again burned in 1960, so it is doubtful if these cedar swamps will ever again exist. There are many scattered trees on sandstone in the Los Burros Creek drainage at low elevations. Although they are occasionally as much as a mile distant from the serpentine ridges to the west, presumably there are serpentine ions in the groundwater, and, since there are few competing species, the cypresses have succeeded in establishing themselves. I have found only one small grove on the serpentine above these scattered trees in the Los Burros drainage.

As with many other species that occur in mesic habitats, some of the cypresses have established themselves on the rocky ridges that sometimes mark the upper borders of the cypress groves, but if one has the courage to explore, it is apparent that most of the trees are growing in relatively damp places and even, occasionally, in small swamps. A few of the cypress groves, including the easily accessible grove just north of San Luis Obispo, west of the Cuesta Grade, appear to be quite dry. Despite appearances, however, on the foggy morning of September 22, 1958, the ground beneath the cypress trees in this grove was wet down to the zone of permanent moisture.

The only Forest Service station in the entire area that keeps moisture records is on Rocky Butte at 3590 feet, about 1000 feet higher than the cypress groves. On numerous mornings which are described as "clear" on their records, the relative humidity readings are recorded as being as high or higher than they are on mornings when fog is specified at that altitude. This corroborates my impression that the coastal fogs rise to a considerable altitude in the Santa Lucia Mountains and that the cypress groves probably receive an appreciable amount of moisture from summer fogs. In wet years some of the groves must receive a surprising amount of rain. At the 7X Ranch at the foot of Cypress Mountain near the headwaters of Las Tablas Creek, the rainfall varies from 40 to 80 inches annually (San Luis Obispo County Water Survey). The average at the Krenkel Ranch near Alder Creek is 60 inches. In a wet year at the Ocean View Mine near Burnett Peak, the rainfall was 117 inches, and in the dry winter of 1960-61, the total rainfall was more than 36 inches, the rain gauge having overflowed in one storm.

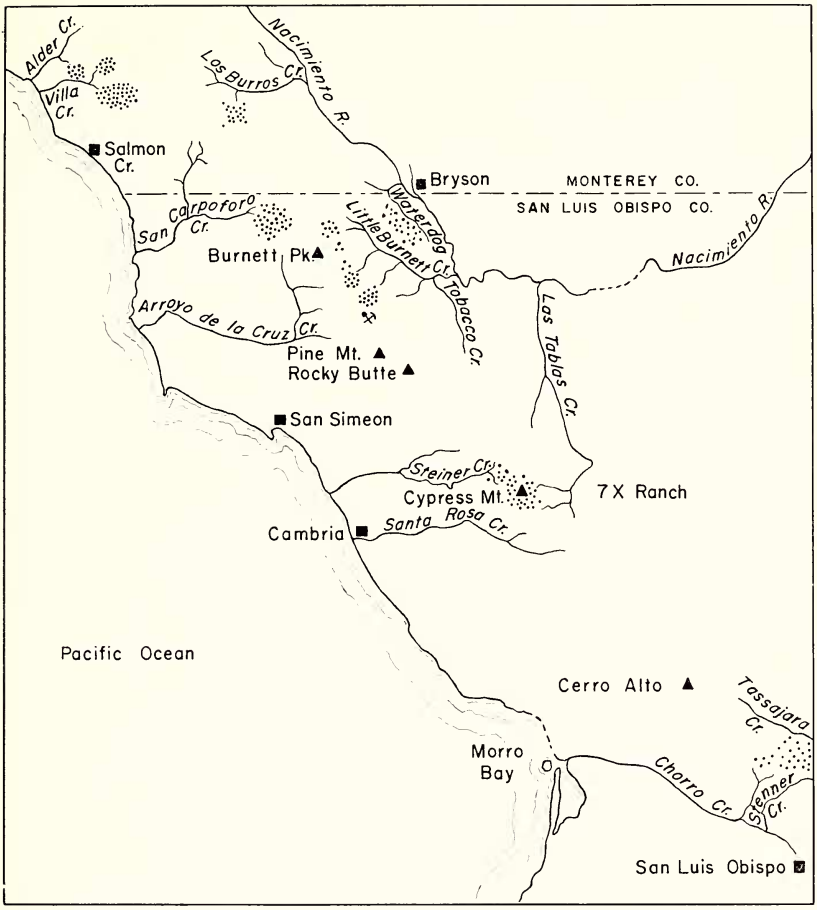

FIG. 1. Distribution map of *Cupressus sargentii* in the Santa Lucia Mountains.

Typically the boundaries of the cypress groves are sharp, with their drier edges bordered in the northern part of the range by mixed *Quercus-Pinus-Pseudotsuga* woodland, and in the southern part by *Quercus-Pinus* woodland.

On the eastern edge of the Santa Lucia Mountains there are two cypress groves, one large grove on a northeast-facing slope at the headwaters of Waterdog Creek and a small grove in a swampy ravine at the head of the main branch of Los Burros Creek. These groves occur along the King City Fault. On the main ridge, along the Pine Mountain Fault, there are approximately fourteen groves. The largest and most southerly grove occurs west of the Cuesta Grade five miles north of San Luis Obispo and includes the Chorro Creek grove described by Carl B. Wolf in "The New World Cypresses" (El Aliso 1:1–444. 1948). The cypresses extend

down the north side of the mountain as well as the south, and there are a few trees in Tassajara Creek. The next grove to the north is also large and is located on Cypress Mountain. Cypress Swamp is an area of springs in the extension of this grove down Delaganna Creek, a tributary of Las Tablas Creek. There are many groves near Burnett Peak where the tributaries of Arroyo de la Cruz, San Carpoforo (Chris Flood Creek), Tobacco and Little Burnett creeks have their origins on the main ridge of the Santa Lucias. Many of these groves are small, as well as inaccessible, and I was not able to explore them before they were burned in the fire of 1960 and sprayed with 2-4-D in 1961. I am not sure how much of this area is included in Dr. Wolf's description of the "Pine Mountain Grove." There are actually many small well-defined groves and not one large one as he implies. Also the grove at the head of Chris Flood Creek could not have been included since it was virtually impossible to reach until a few years ago. There are two groves at the head of Villa Creek in Monterey County, one north and one south of Lion Den Spring. The most northerly grove in the Santa Lucia Mountains is on the small tributary of Alder Creek that joins the main stream about half a mile below the public camp ground. North of Alder Creek the serpentine formation dips down and disappears beneath the ocean at Plaskett Creek.

Some of the groves have a thick layer of leaves covering the ground, and in these groves there are few herbaceous species except along the streambeds or rock outcrops. In other groves there has been a great deal of sheet erosion and a number of species grow in crevices in the rocks and on the relatively level areas. In spite of the great diversity in appearance of the different cypress groves, the associated flora is surprisingly uniform, and one can expect to find many or all of the species listed below in any but the smallest cypress groves. Although I have not attempted a complete list of cypress forest endemics and associated northern species, I have included those which are characteristic of the majority of the groves.

Pinus sabiniana Dougl.

P. coulteri D. Don

Dendromecon rigida Benth.

Eriodictyon californicum (H. & A.) Torr. As far south as Cypress Mountain.

Quercus durata Jepson

Ceanothus spp.

Arctostaphylos spp. Typically *A. obispoensis* Eastw.

Lomatium parvifolium (H. & A.) Jepson

Zigadenus fremontii Torr.

Brodiaea lutea (Lindl.) Mort. In the southern Santa Lucias, this species is not common and occurs only near springs and beside streams.

Fritillaria lanceolata Pursh

Polygala californica Nutt.

Eriophyllum confertiflorum (DC.) Gray var. laxiflorum Gray. Occasional plants of what appears to be *E. lanatum* (Pursh) Forbes as well as hybrids with *E. confertiflorum* occur on nearby serpentine outcrops.

Cheilanthes siliquosa Maxon. Occasionally *C. californica* (Hook.) Mett. or *C. carlotta-halliae* Wagner & Gilbert also grow in the cypress groves.

Chorizanthe vortreidii Bdg. As far south as Burnett Peak. This local endemic is rare on serpentine at high altitudes in the Santa Lucias but common on sandstone, especially at lower elevations.

Galium hardhamae Dempster. A Santa Lucia cypress forest endemic occurring as far south as Cypress Mountain.

Galium californicum H. & A. *Galium nuttallii* Gray and *G. andrewsii* Gray also occur in one cypress grove or another.

Monardella palmeri Gray. A Santa Lucia cypress forest endemic which occurs occasionally elsewhere on serpentine (Rinconada Mine east of Santa Margarita, *Hoover 6146,* and the west side of Cerro Alto). When it occurs in a cypress grove, the leaves are long, narrow and shiny. Outside the cypress forests the leaves are relatively dull and reminiscent of whatever variety of *M. villosa* Benth. grows nearby. In other characters as well, the plants appear to be intermediate. *Monardella villosa* does not grow in the cypress groves.

In addition to the species in the above list, almost every cypress grove has some species of *Carex*. In groves with much litter covering the soil, the *Carex* is generally *C. globosa* Boott, which also occurs in the nearby oak-conifer woodland. *Carex serratodens* W. Boott grows beside the permanent streams and semipermanent streams. *Carex senta* Boott occurs in Cypress Swamp. Of the other three species of *Carex,* discussed below, one is a local endemic and the other two are northern species.

Carex obispoensis Stacey, a San Luis Obispo County endemic, occurs along the intermittent streams and in low or level places along the top of the ridge in the Cuesta cypress grove and in openings in the surrounding chaparral. It also grows on a rocky east-facing slope almost throughout one of the Burnett Peak groves which has a small semipermanent stream. In the dry year of 1960, only the plants in the obviously much damper lower half of the grove flowered. It is possible that *C. obispoensis* is primarily a plant of moderately dry serpentine soils and that its occasional occurrence at low elevations in boggy spots along streams that drain cyress groves (Stenner Creek,[1] *Eastwood & Howell 2271* and Arroyo de la Cruz, *Hoover 6684, 7951*) should be considered exceptional. It has also been collected on "dry serpentine" outside of a cypress forest at Rinconada Mine (*Hoover 6115, 7208*).

Carex mendocinensis Olney has been found in three cypress groves. At Alder Creek the cypresses occur on several acres of rocky northwest slope as well as along the course of a semipermanent stream. Here *C. mendocinensis* is common, especially beside the stream. It is also common in the Chris Flood grove, where it grows both beside the intermittent streams and the permanent streams and on a northeast-facing slope that is probably covered with hidden springs since the herbaceous cover is unusually luxuriant for a cypress grove. The small swampy grove at the head of Los Burros Creek also has an abundant growth of *C. mendocinensis*. In Cypress Swamp *C. luzulina* Olney grows beside the small permanent

[1] Stenner Creek, according to the United States Geological Survey maps, is the correct name for this creek, though on many maps it is called Steiner Creek. It is Steiner Creek on the Eastwood and Howell labels. The tributary of San Simeon Creek that has its headwaters on Cypress Mountain is called Steiner Creek.

streams that flow from the springs. I have not found *C. mendocinensis* or *C. luzulina* in the streambeds below the cypress groves.

Many of the usual streamside plants of the Santa Lucias grow in the swampy areas and beside the streams in those cypress groves that have permanent and semipermanent streams, for example, *Mimulus guttatus* DC., *Lilium pardalinum* Kell., and, at Alder Creek, *Epipactis gigantea* Dougl. In Cypress Swamp there are two northern hydrophilous species as well, *Habenaria dilatata* (Pursh) Hook. var. *leucostachys* (Lindl.) Ames and *Parnassia palustris* L. var. *californica* Gray. Both of these plants have been collected elsewhere in this region, the *Parnassia* on Santa Lucia Peak by *M. S. Clemens* in 1921, and the *Habenaria* in a swamp at Arroyo Grande, *Hoover 7338*.

Until recently most of the groves had never been thoroughly explored and it was thought that the cypresses were restricted to the dry serpentine outcrops. In reality they are most abundant on mesic, north-facing slopes where they grow in the vicinity of streams and in swampy areas produced by springs. In several places the cypresses do not occupy the total area of apparently suitable moist habitat. Neither do the associated species extend beyond the sharply delimited boundaries of the groves. It is understandable that the cypress trees may not be able to grow down the beds of streams for any distance below the serpentine to which they are usually restricted, but it is surprising that the associated species are similarly limited. As already mentioned, the two northern species of *Carex*, *C. mendocinensis* and *C. luzulina*, do not grow in the watercourses below the boundaries of the cypress groves. The cypress groves seem to offer these species a special ecological niche upon which their persistence depends. Although the causal relationships are not fully apparent, it seems probable that the discontinuous occurrence of the cypress groves, their usual sharp delimitation, and the restriction of the associated species to the groves depend both on the influence of the serpentinized soil, which may act by reducing competition from the neighboring chaparral and forest species, and on the obvious need of all these species for a relatively abundant water supply.

It is possible that cypress forests were formerly more extensive in the Santa Lucia Mountains. Typical cypress forest species occur in at least three areas where cypress trees do not grow. *Carex obispoensis* and *Monardella palmeri*, the latter showing evidence of integration with *M. villosa*, have been found in one or two places on serpentine south of the Cuesta cypress grove as well as on Cerro Alto north of that grove. Similarly, near the Burnett Peak cypress groves *Galium hardhamae* and *Monardella palmeri* grow in occasional chaparral openings where there are no cypresses.

Vouchers for all these cypress forest species have been deposited at the Herbarium of the California Academy of Sciences.

Mr. James Collord, geologist for the Madonna Construction Company

of San Luis Obispo, described for me the geology of the Pine Mountain fault zone where most of the cypresses occur and helped me to explore the Burnett Peak and Chris Flood Creek groves.

Creston Star Route
Paso Robles, California

CALIFORNIA BOTANICAL EXPLORERS—XII

Willis Linn Jepson

John Milton Bigelow

[The following account of a significant portion of Bigelow's whereabouts and itinerary as a botanical traveler in central California is as pertinent and needful today as it was when Dr. Jepson originally wrote it, pin-pointing as it does the type localities of a number of well-known and more or less widespread species originally collected by Bigelow at the annoyingly elusive "Duffield's Ranch" of the Torrey account in the Pacific Railroad Reports. The first five paragraphs have already been published (in the twice resuscitated journal "Erythea," vol. 3, No. 13, pp. 102–104, Dec., 1938), this initial portion ending with the promise "to be continued." Inasmuch as this number of "Erythea" had a very limited circulation and is not likely to be available to many readers, the entire article, from a typescript copy recently come to light among Dr. Jepson's accumulated papers, is offered herewith.—R. Bacigalupi, Curator, Jepson Herbarium, Department of Botany, University of California, Berkeley.]

The name of Bigelow is associated with many of the early discovered plant species of California. John Milton Bigelow was born at Peru, Bennington County, Vermont, on June 23, 1804. When he was eleven years old, his family moved to Ohio where he went to the public schools and attended the Medical College of Ohio, at which institution he was graduated March 8, 1832. In November of this same year, he was married to Maria R. Miers of Lancaster, Ohio, where he began the practice of medicine. In 1850 he was appointed surgeon to the Mexican Boundary Commission. While on duty with this survey, he collected and studied the native vegetation of the boundary. His specimens formed part of the material used by John Torrey in the preparation of the Report of the Mexican Boundary Survey (1859), which was under the charge of Major W. H. Emory. Bigelow's name is frequently cited in its pages. In 1853 Dr. Bigelow accepted the position of surgeon and botanist to the expedition of the Pacific Railroad Survey under Lieutenant A. W. Whipple, which left Fort Smith, Arkansas, and proceeded along the Canadian River and across the Llano Estacado to Albuquerque. The Rio Grande was crossed on November 10, 1853 and the expedition, following down the Bill Williams Fork, crossed the Colorado River at the mouth of Williams Fork on February 28, 1854, ferried it about sixty miles above and traversed the Mohave Desert to the Cajon Pass, thence to Los Angeles and San Pedro. Here the survey of Lieutenant Whipple ended; but it was